PLATE XVI.

Xenelaphis ellipsifer, p. 184. ⅔ nat. size.

Upper and side views of head and neck and of middle of body.

PLATE XVII.

Fig. 1. *Amblycephalus nuchalis*, p. 185. Upper and side views of head and neck.
1 *a*. Lower view of head, × 1½.
1 *b*. Dorsal scales, × 1½.
2. *Rhacophorus shelfordi*, p. 185.
3. *Ixalus petersi*, p. 185.
4. *Calophrynus heterochirus*, p. 186.

2. On the Brain of a Siamang (*Hylobates syndactylus*). By FRANK E. BEDDARD, M.A., F.R.S., Prosector and Vice-Secretary to the Society.

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The death of the Society's specimen of this rare Anthropoid Ape [1] has enabled me to study an exceedingly well-prepared brain.

In bringing before the Society some notes upon the cerebral characters of this Ape, I am not breaking new ground. More than thirty years ago Sir William Flower [2] described the general outline of the brain of this Ape from a cast of the cranial cavity. The account was accompanied by several woodcuts in the text, illustrating one remarkable feature in the brain, which was described in the following words: "The most striking peculiarity of the brain is the backward projection of the cerebellum beyond the level of the cerebral hemispheres, a circumstance, as far as I am aware, unknown in any of the Apes either of the Old or New World."

This feature is not shown distinctly, but there are indications of it, in Prof. Kohlbrügge's figure [3] of the brain of the Siamang. It appears from the latter drawing that the cerebellum would be visible on an inspection of the brain from above, though Kohlbrügge remarks that the contrary is the case—without, however, referring to Flower's observations on the matter, having been unable to study his paper. Prof. Kohlbrügge examined eight brains of this Ape. Other writers upon the brain-structure of *Hylobates syndactylus* are Sandifort [4] and Waldeyer [5]. Thus not more than ten brains of this species (or genus ?) have been studied. It is not therefore perhaps superfluous to extend this list to eleven brains.

[1] Presented by Mr. Stanley S. Flower, F.Z.S. (See P. Z. S. 1898, p. 588.)

[2] Nat. Hist. Review, 1863, p. 279.

[3] "Versuch einer Anatomie des Genus *Hylobates*," in Max Weber's Zool. Ergebn. Bd. ii. p. 186.

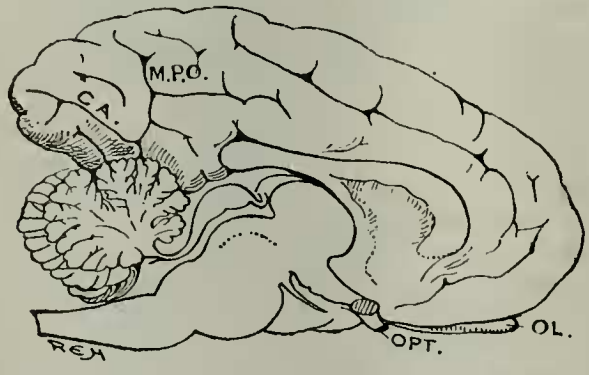
[4] Verhandelingen over de natuurlijke geschiedenis der Nederlandsche overzeesche bezittingen. Leiden, 1840.

[5] "Das Gibbongehirn," Internat. Beitr. z. wiss. Med. Festschr. Virchow, Bd. i. For this reference I am indebted to Dr. Keith's paper on the Gibbon in 'Nat. Science,' vol. ix.

The animal when dead weighed 5 lb. 9 oz., there being no undue distention of the stomach and alimentary canal with food. The weight of the fresh brain was 4 oz. It was preserved first of all in weak spirit (about 45 per cent.), and then, after 24 hours and removal of the pia mater, transferred to strong spirit.

With this treatment the brain seems to have altered very little from the conditions observable in life. There is no suggestion in the appearance and direction of the sulci of any changes. I was therefore very much surprised to see the relations of the cerebellum to the cerebrum, which are apparent in the accompanying drawing (fig. 1). The cerebrum not only completely covers the cerebellum, but extends for some way beyond it. With even a liberal discount for contraction (of which, however, I do not see the need), it is difficult to understand the brain-cast—of the accuracy of which there can be no question—prepared by Sir W. Flower, save on the hypothesis of an abnormality [1].

Fig. 1.



Brain of Siamang. Inner view of left hemisphere.

M.P.O., mesial parieto-occipital fissure; CA., calcarine; OPT., optic nerve; OL., olfactory.

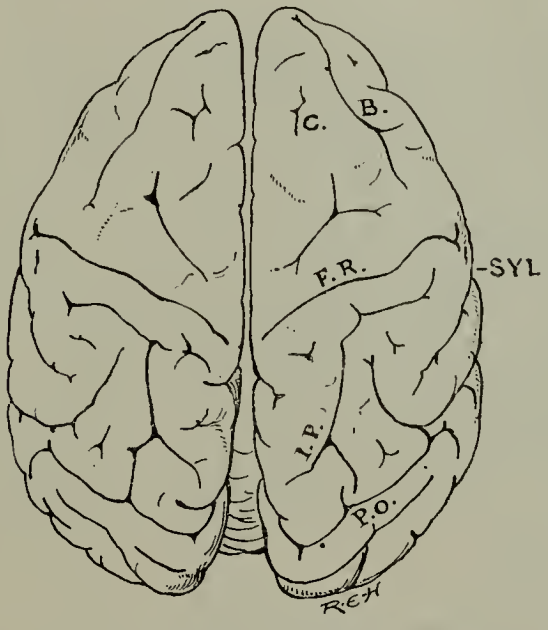
The *Sylvian fissure* seems to call for no particular remark. The anteriorly directed *fronto-orbital fissure* is well developed, and the exposed *island of Reil* is extremely conspicuous. This is, however, by no means a peculiarity of *Hylobates syndactylus* as compared with other Gibbons.

The *parieto-occipital fissure*.—I take it that the fissure lettered P.O. represents the parieto-occipital fissure of other Apes plus the Simian fissure. It will be observed that on both sides of the brain the Simian fissure, instead of terminating without reaching the mesial surface of the brain, as is often the case with Anthropoid Apes, bends forward and joins the parieto-occipital (fig. 2, p. 189).

[1] Dr. Keith has pointed out to me that the overlapping of the cerebellum by the centrum is a characteristic of youth, and that the brain-cast studied by Sir W. Flower was therefore that of an old animal.

The *mesial parieto-occipital fissure* (M.P.O., fig. 1, p. 188) on the left side of the brain passes straight downwards from the superior surface of the brain and joins the calcarine (CA.) below. On the right half there is a little complication: there is a forwardly directed branch of which only an indication exists on the left side. Slighter furrows pass forwards from the mesial parieto-occipital. In the form and direction of the mesial parieto-occipital fissure there are no noteworthy differences from the other brains with which I have compared it.

Fig. 2.



Brain of Siamang. Dorsal aspect.

SYL., Sylvian fissure; F.R., fissure of Rolando; I.P., Intra-parietal; P.O., parieto-occipital; B., frontalis inferior; C., frontalis superior.

The *calcarine fissure* (CA.) most obviously joins the mesial parieto-occipital fissure, as is shown in the accompanying drawing (fig. 1), and at a point nearer to the superior surface of the brain than it does in a brain of *Hylobates hoolock* which I have examined. On the left side of the brain this fissure forked into a Y posteriorly. In this junction of the mesial parieto-occipital with the calcarine *Hylobates syndactylus* agrees with Man and the Chimpanzee, but apparently not with the Gorilla. In a brain of *H. leuciscus* in my possession there was no such junction; the mesial parieto-occipital curved forwards parallel with the calcarine. The latter fissure was markedly Y-shaped, the three limbs of the Y being almost equal in length.

As is the case with *H. hoolock*, the *fissure of Rolando* is independent of other fissures at both ends of its oblique course. On

the left side it plainly stops short some little way above the Sylvian fissure; on the right side a faint groove continues it into that fissure. Mesially neither fissure dips into the inter-cerebral sulcus. That of the right side comes a little closer than does that of the left; and it is curious that this detail is repeated in my brain of *H. hoolock*. The fissure of Rolando has no branches along its course, and is entirely unrelated to other fissures.

The hemisphere measures along its curvature $3\frac{1}{4}$ inches, and the fissure of Rolando arises $2\frac{7}{8}$ inches from the anterior end. It is thus considerably behind the middle of the cerebrum. In *H. hoolock*, which has a longer brain, the corresponding figures are $3\frac{1}{2}$ and $2\frac{1}{8}$.

The frontal lobes are thus larger in *H. syndactylus*; they have a comparatively smooth appearance as in *H. hoolock*.

Of the furrows traversing this lobe I recognize the præcentralis superior, the frontalis superior, and the frontalis inferior.

The *præcentralis superior* is deeply cut but not extensive. On the left side it begins by being parallel to the fissure of Rolando, but ultimately bends much more forward. It is not connected with the frontalis superior. On the right side the fissure is more "normal" in direction, and is connected with the second fissure referred to. It may be that the anterior half—the forwardly directed portion—of the supposed præcentralis is really the base of the frontalis superior; but I think that it is not for the following reasons: intermediate conditions are seen in two other Gibbons' brains in my possession. In one (*H. leuciscus*) the two *præcentralis* fissures are quite parallel with the fissure of Rolando; in the other brain (*H. hoolock*) both fissures have so diverged from the normal (?) that they are almost parallel to the inter-cerebral sulcus.

The *frontalis superior* is represented by detached tracts which are deeply excavated.

As is the case with the other two Gibbons' brains which I have examined, the *frontalis inferior* is a very strongly marked and long fissure. On the right side this fissure was forked posteriorly, and it is quite likely that this region really represents the præcentralis inferior, well developed in the other Gibbons, and on both sides.

Intra-parietal fissure.—As can be seen from the drawing exhibited (fig. 2, p. 189), this fissure is very much the same on both sides of the brain; that portion of the complex furrow termed by Dr Cunningham *postcentralis superior* is not well developed and is detached from the rest. It was also detached though very well developed in *H. leuciscus*; in *H. hoolock* it was perfectly confluent, the whole fissure being of the characteristic **T**-shape. I lay no stress upon these differences, which are in all probability individual. They only offer additional evidence of the unreliable nature of cerebral fissures for systematic purposes.